

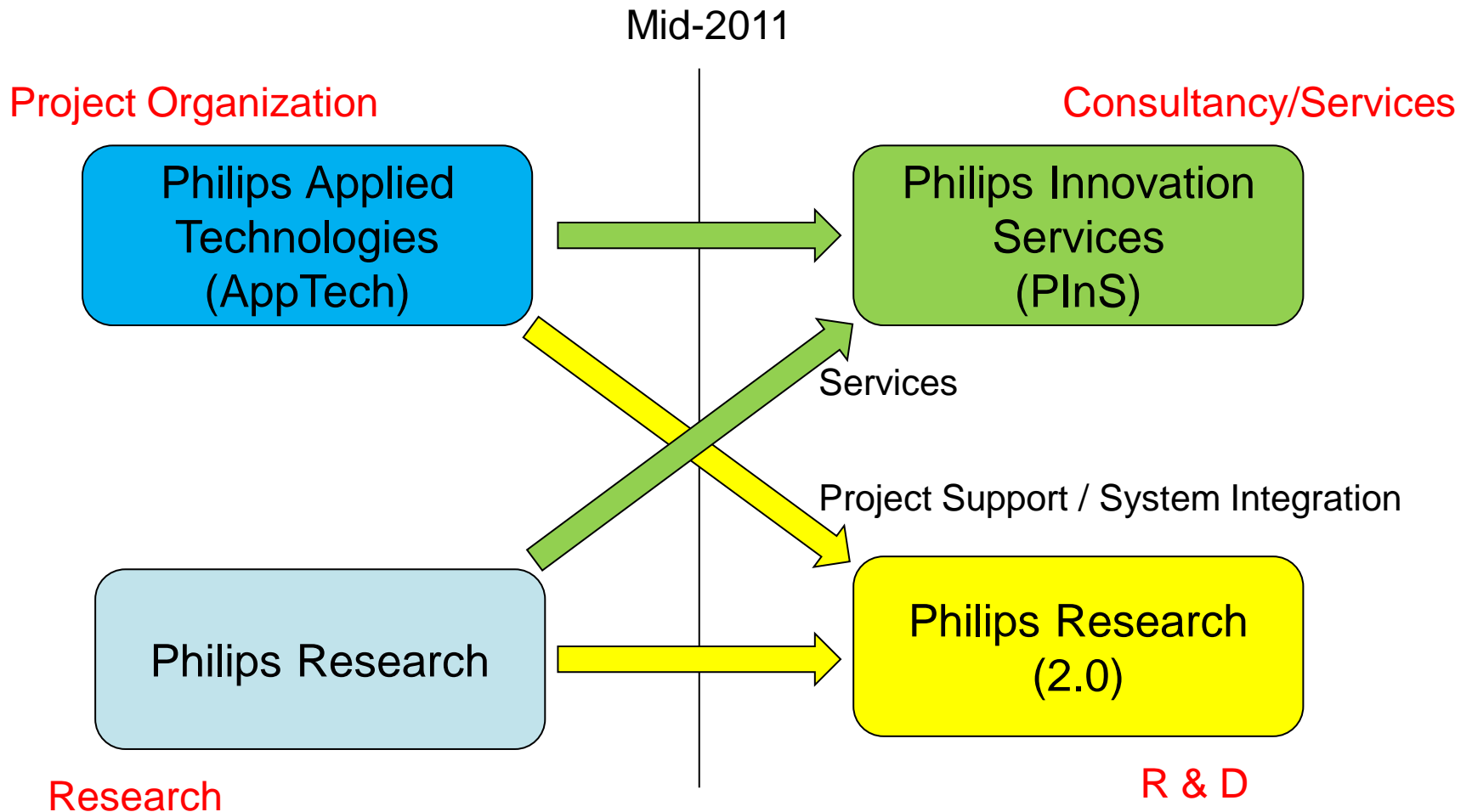
PHILIPS

sense and simplicity

Proton Therapy System

Patrick Bonné, Philips Research
SASG June 2012

Restructuring of Philips Corporate Technologies



Project Context

- External customer
- Proton Therapy System (Medical Device, Class C – IEC:62304)
- (Single) software component not stable
 - Working for several years with multiple teams
 - No accreditation → facility may not be used to treat patients

PHILIPS

sense **and** simplicity

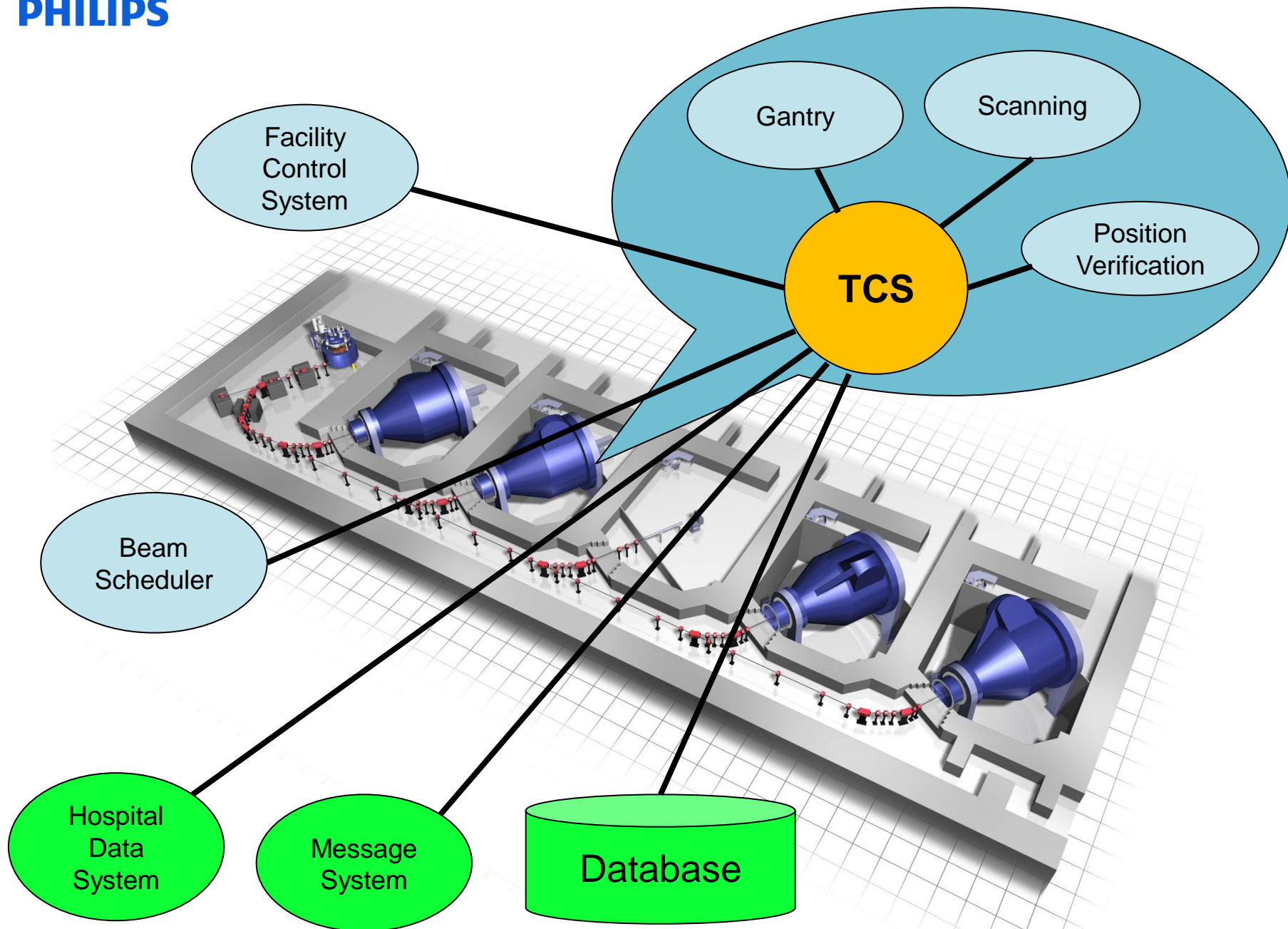
Simulator based development & testing of a sub-system

Patrick Bonné, Philips Research
SASG June 2012

Goal:

- Share some backgrounds on the simulation based development/test environment setup that has become a “best practice” in Philips Research.

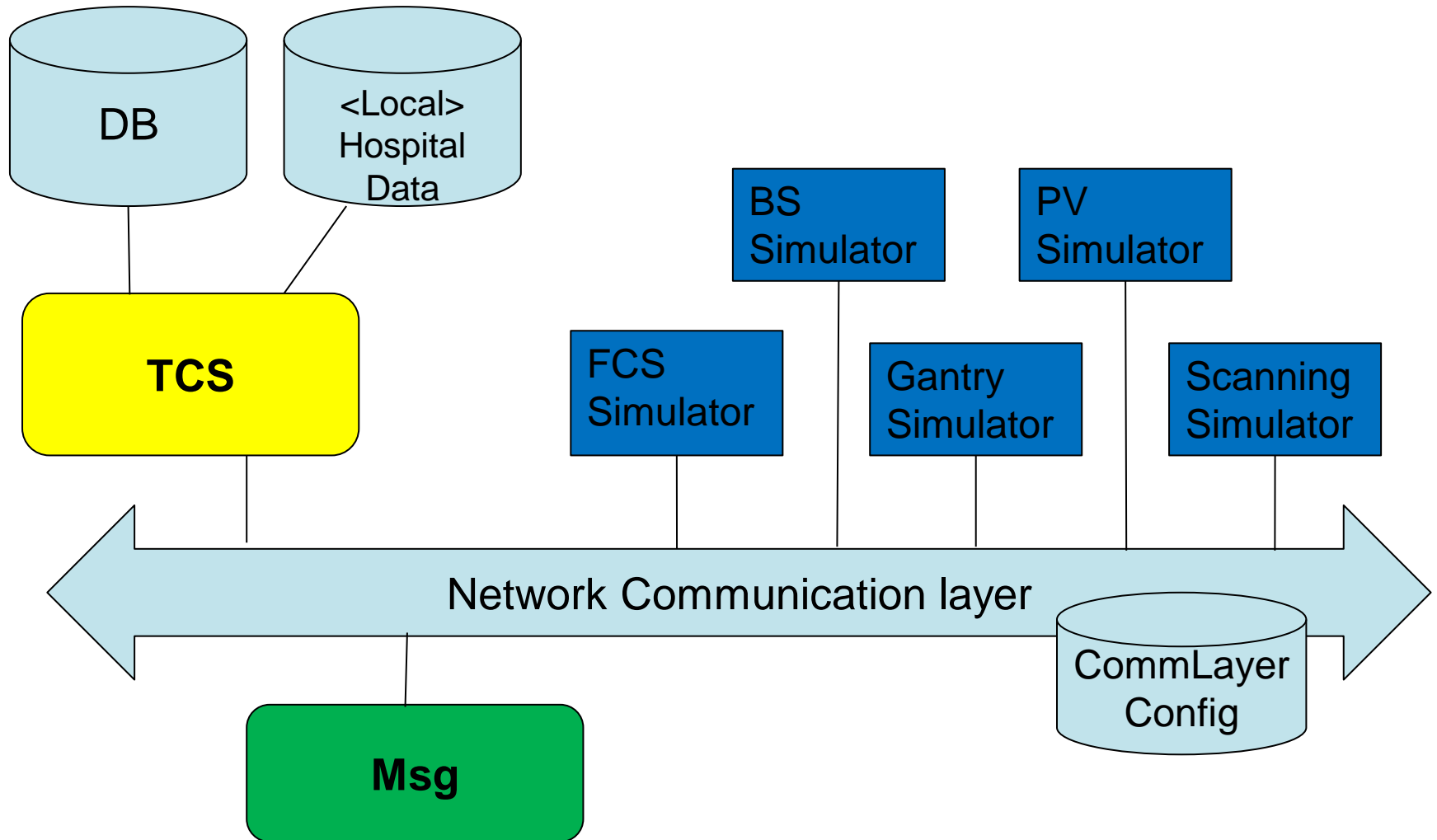




Why simulators

- Real product not available
 - intelligent stubbing (development / integration / testing)
- Interface specification incomplete (actual status exists in code)
 - Qualitative good interface documentation
 - Used as acceptance criteria (→ gap management)
- Unbalanced requirements of TCS
 - User observable behavior
- Need to exercise special situations
 - You can't just stop a cyclotron
 - Playing around with protons is dangerous

Development Environment



Simulator requirements

- Must display user observable state & behavior
- Option to enable automatic scenario support
- Possibility to alter timing and “simulator generated data”
- Controls to trigger exceptional situations
- Controls to trigger “out-of-specification” behavior
- Logging
- API: execute action, set/get properties, wait for states

Simulator: appearance

Simulator - Control system / Room 3
File TC-Interface ?

Actions Commands Ignore/Delay Cmds

- changeFacilityState
- changeVentilationState
- changeImmoPumpState
- changeRoomSecurity
- revokeBeam**
- confirmDisabled
- changeLayerData
- changeBeamAssignTime

Name	Type	Value
reason	UINT	0

Last sent: successful

Datamodel

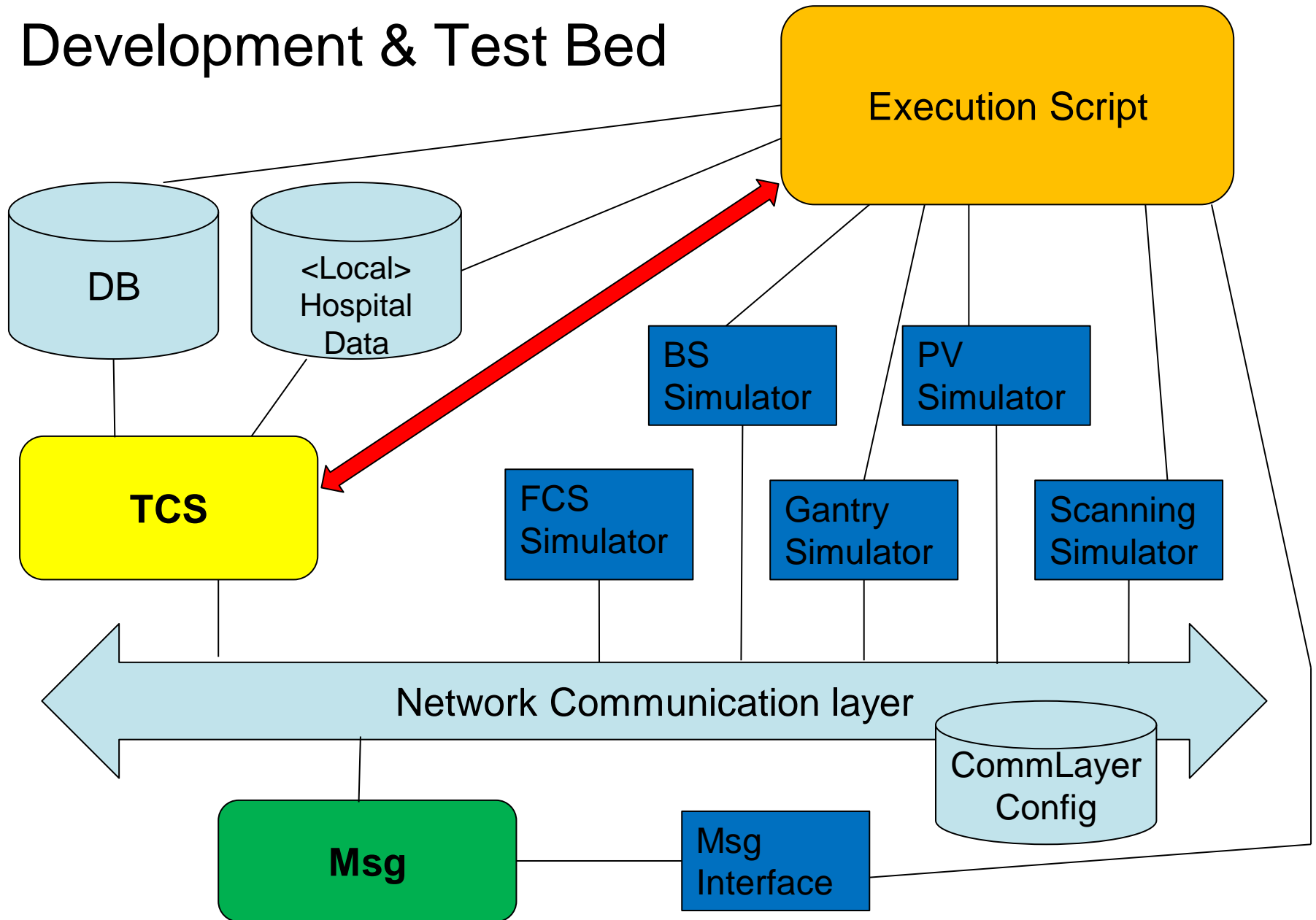
Name	Type	Value
cs.roomNumberLogOff	UINT	0
cs.roomNumberTCS	UINT	0
cs.roomSecurityState	UINT	3
cs.scState	UINT	0
cs.sendingRetryCount	UINT	3
cs.systemTypeLogOff	UINT	0
cs.systemTypeTCS	UINT	0
cs.tcsState	UINT	0
cs.timeInFacilityStateChan...	UINT	30
cs.ventilationState	UINT	0
cs.wrongPartnerIdTCS	UINT	0
cs.wrongPartnerIdTCSCmd	UINT	0
roomNoSimulator	UINT	3

History

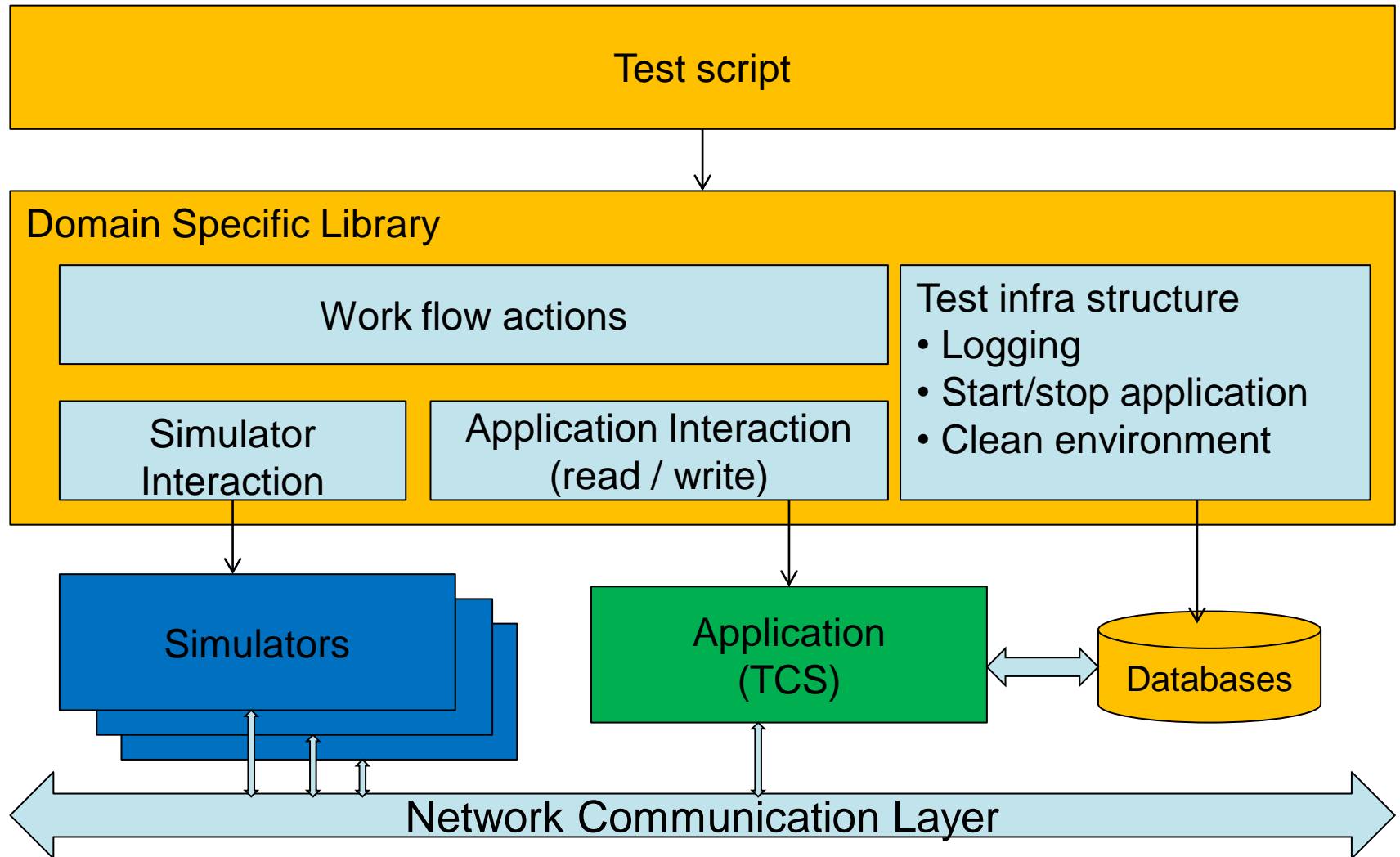
Time	Action/Cmd/Event	
20.05.2012 22:14:08.856		AtCsFSM::NULL_PowerDown_
20.05.2012 22:14:08.856	TcPowerOn	AtCsFSM::PowerDown_TcsLoggedOff_TcPowerOn
20.05.2012 22:14:08.856		AtBsFSM::NULL_PowerDown_
20.05.2012 22:14:08.856	TcPowerOn	AtBsFSM::PowerDown_TcsLoggedOff_TcPowerOn
20.05.2012 22:14:08.856		CsBsMainFSM::NULL_PowerDown_
20.05.2012 22:14:08.856	TcPowerOn	CsBsMainFSM::PowerDown_TcsLoggedOff_TcPowerOn

Lock Current state(s): AtBsFSM::TcsLoggedOff; AtCsFSM::TcsLoggedOff; CsBsMainFSM::TcsLoggedOff

Development & Test Bed



Automatic test architecture



Application Test Interface

- *GUI Record/Playback tool (Rational Robot)*

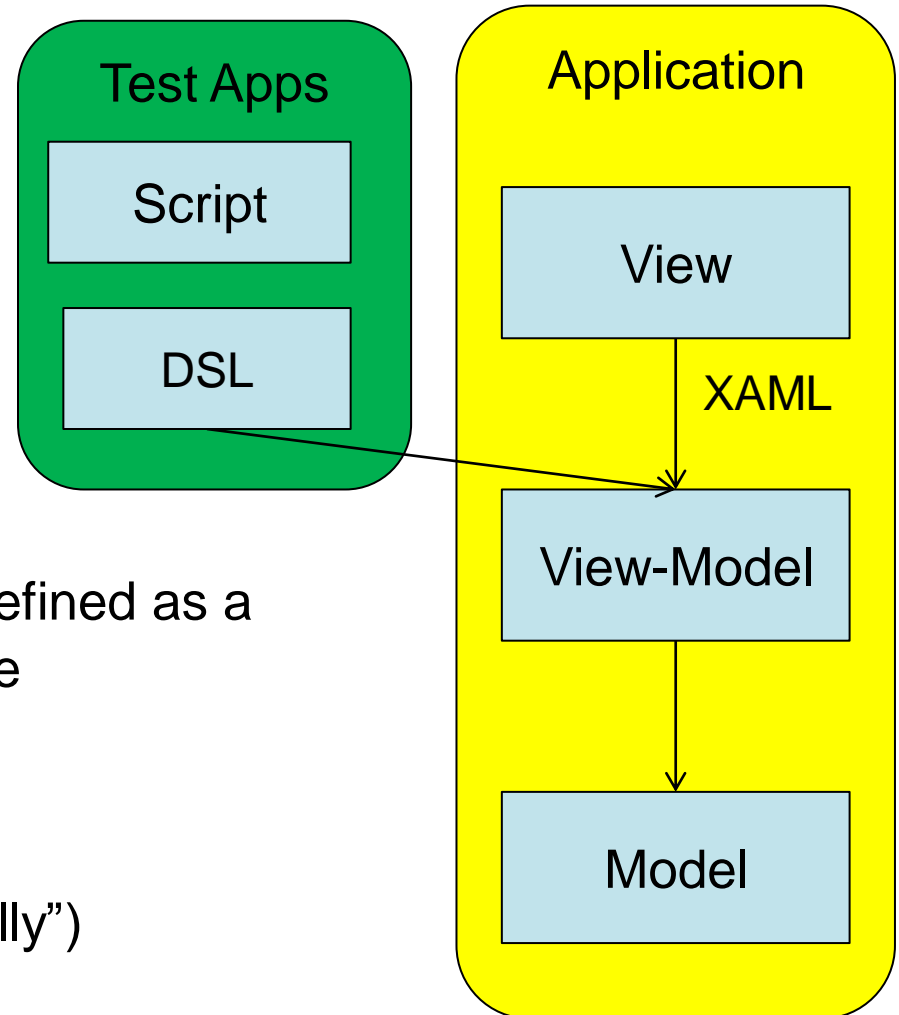


- Difficulties in recognition of screen elements
- Script execution very sensible for external (window) events
- Script language and development environment not state of the art
- Tests can only use visible information on the screen
 - Difficult to check the absence of elements

Application Test Interface (2)

- *Test Interface*

- Use the MVVM paradigm (based on MS-WPF)
- Views do not have any additional intelligence
- The View-Model interface is defined as a remoting interface, used by the Domain Specific Library
- Used for functional tests (appearance is tested “manually”)



Summary

- Discussed some aspects used to set-up a generic (automated) development/test environment based on simulators
 - Balanced requirements
 - Simulate 2nd order and “out-of-specification” behavior
 - Automatic basic workflow
 - Logging
 - Provide an API to all elements of the execution environment
 - Application under development
 - Simulators
 - “Domain Specific Library” to control the environment

Concluding

- We have applied this set-up successfully in multiple projects (we think it's worth the investment)
- The particular Proton Therapy Centre is currently operational and patients are being treated with the system

